

GFS MOS parallel evaluation: Preliminary results

MDL Statistical Modeling Branch
8/24/2012

GFS MOS parallel runs:

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Special thanks to: Fanglin Yang, EMC

Verifications and graphics:

Yun Fan: DMO performance

Tamarah Curtis: MOS T/ Td /Max-Min

Eric Engle: MOS winds

Geoff Wagner: MOS PoP

Analysis and presentation:

Mark Antolik, Kathryn Gilbert

Sample of User Complaints...

- “Is the NWS not concerned with how bad the GFS 2mT and GFS MOS are in the midwest/Plains right now for this heatwave? It is really bad, especially on the MAV MOS.”

- Energy Sector User

- “...GFS MOS has been seriously under-forecasting the max temp.” [Missed MOS forecasts] “...make a huge difference in take-off payload”

– Aviation Sector User

- “I don't know if you are watching, but the GFS MOSMEX (mex) temperatures are coming in way short of reality”

– Weather Derivatives Sector User

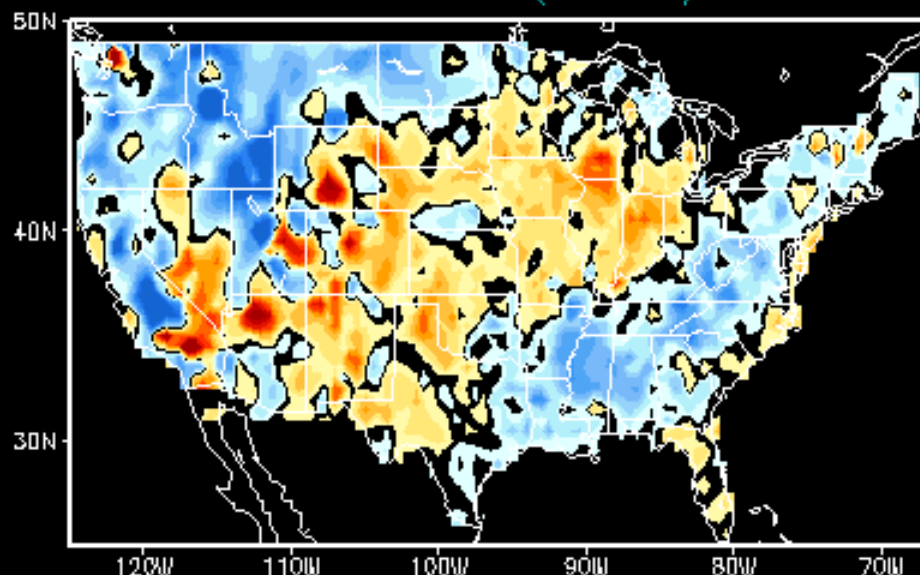
- Forecasters were advised not to use GFS/GFS MOS this summer for boundary layer temperatures

– NWS meteorologist from Central US

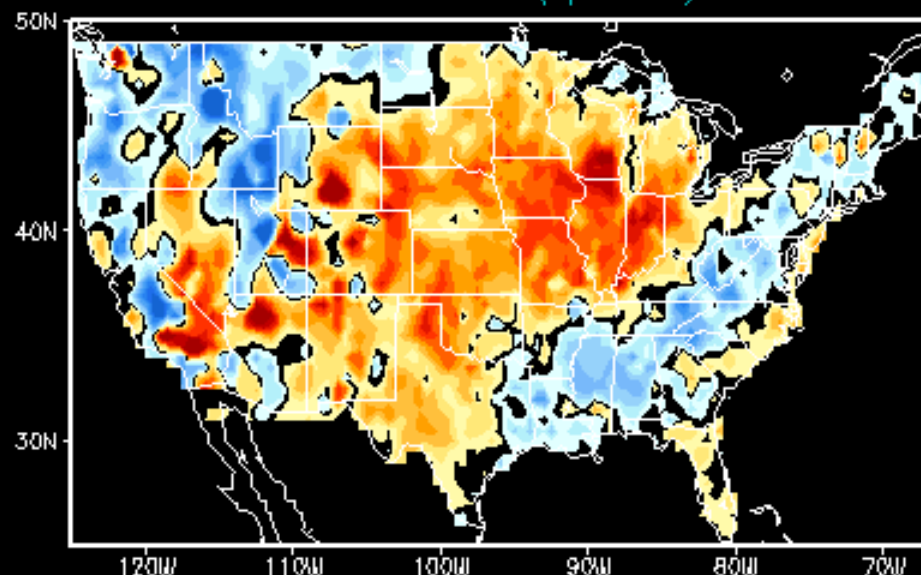
Effect on raw GFS output

GFS Dewpoint Biases (unit: °F, 06 Hrs Projection, 00Z Cycle)

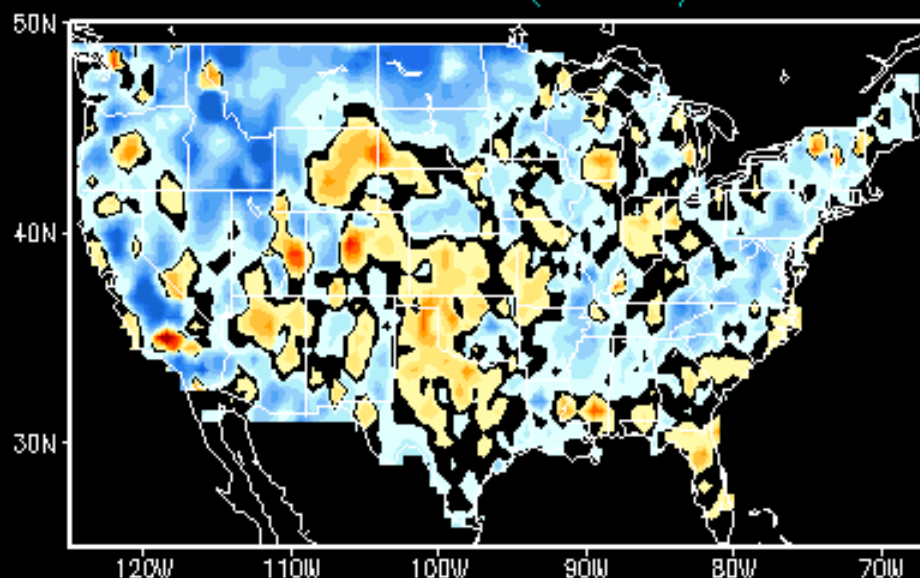
14-30 Jun 2012 (Para-Obs)



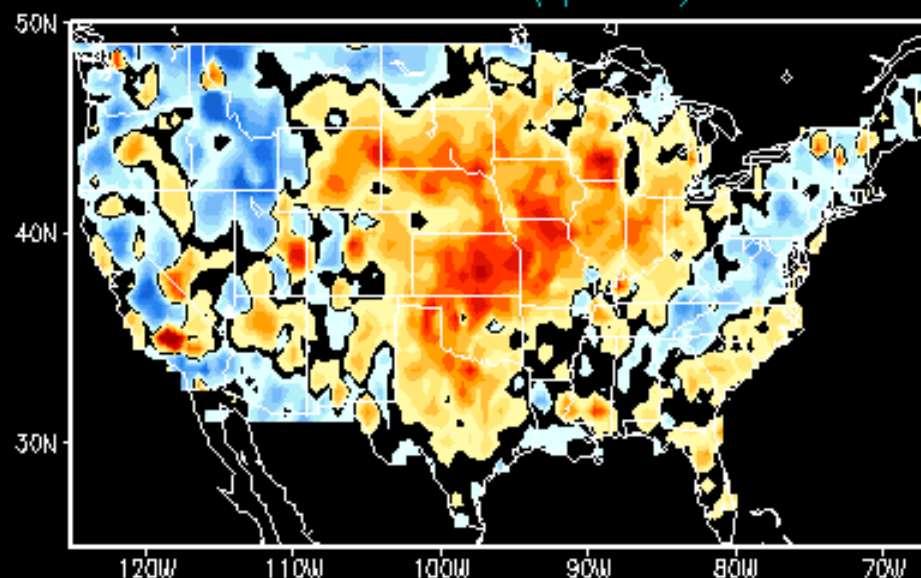
14-30 Jun 2012 (Oper-Obs)



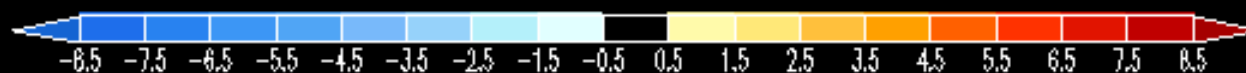
01-17 Jul 2012 (Para-Obs)



01-17 Jul 2012 (Oper-Obs)

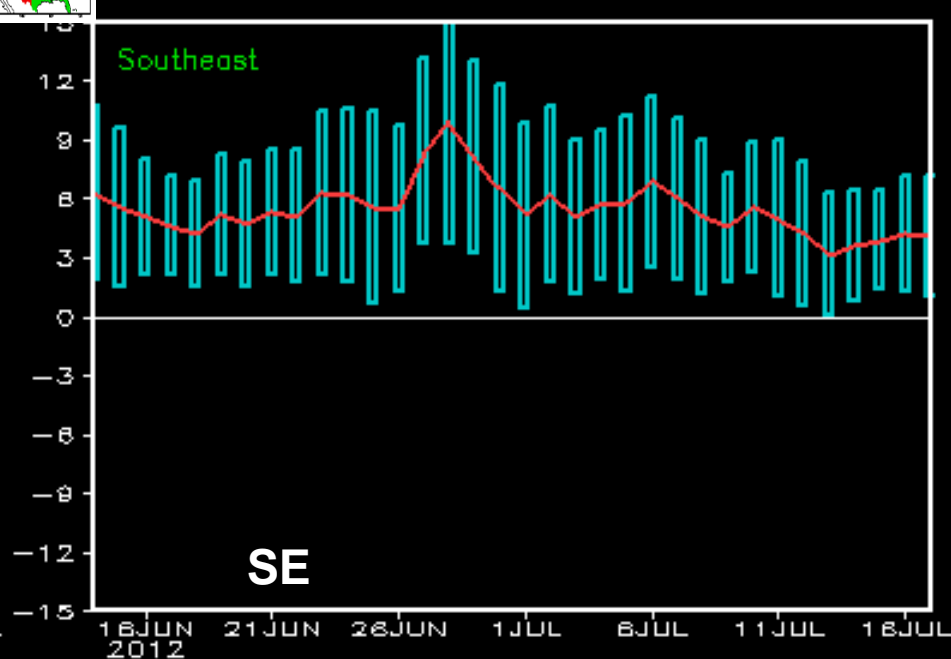
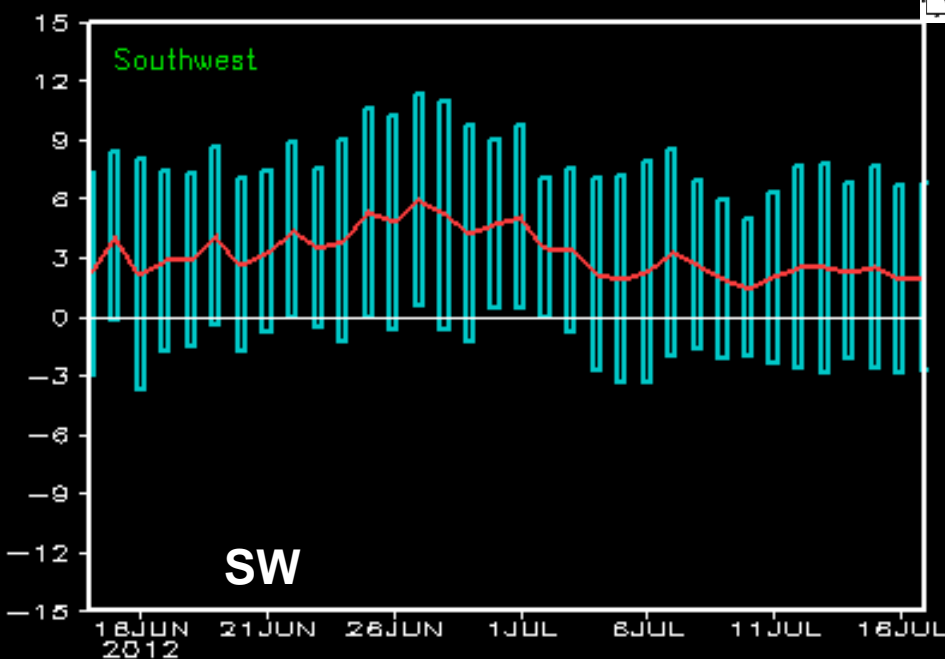
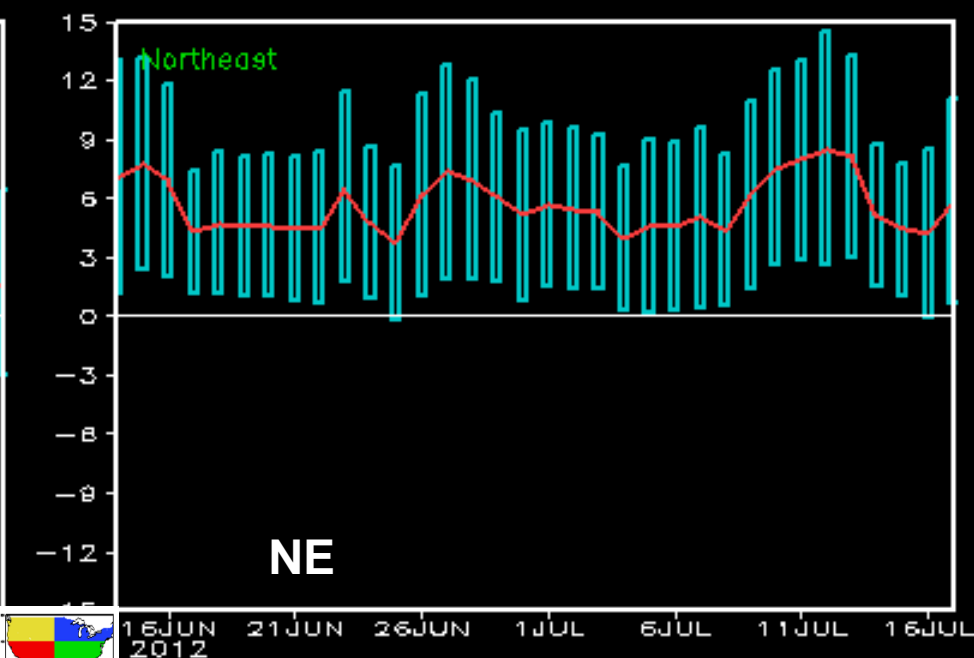
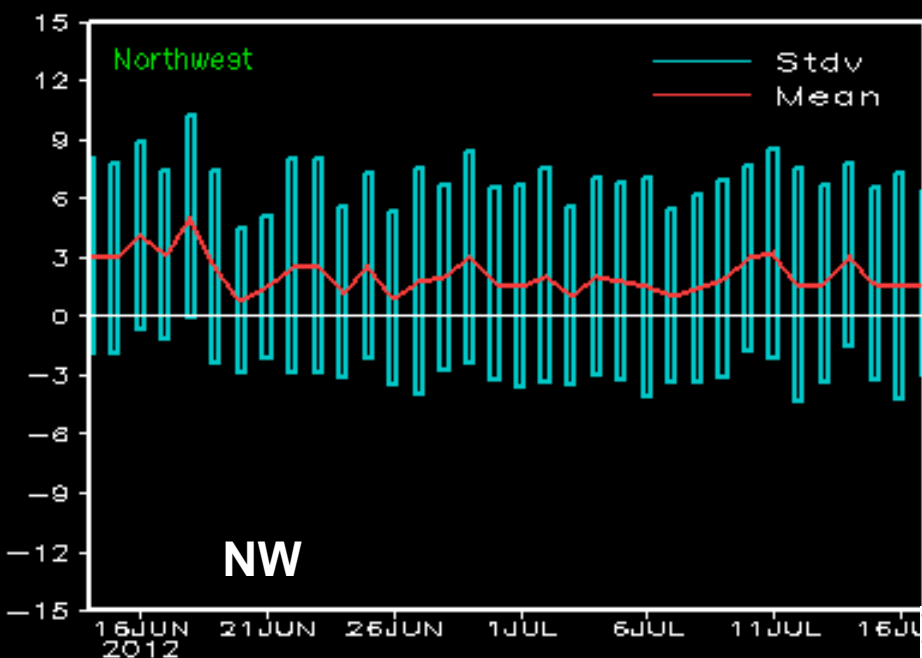


Para - Obs

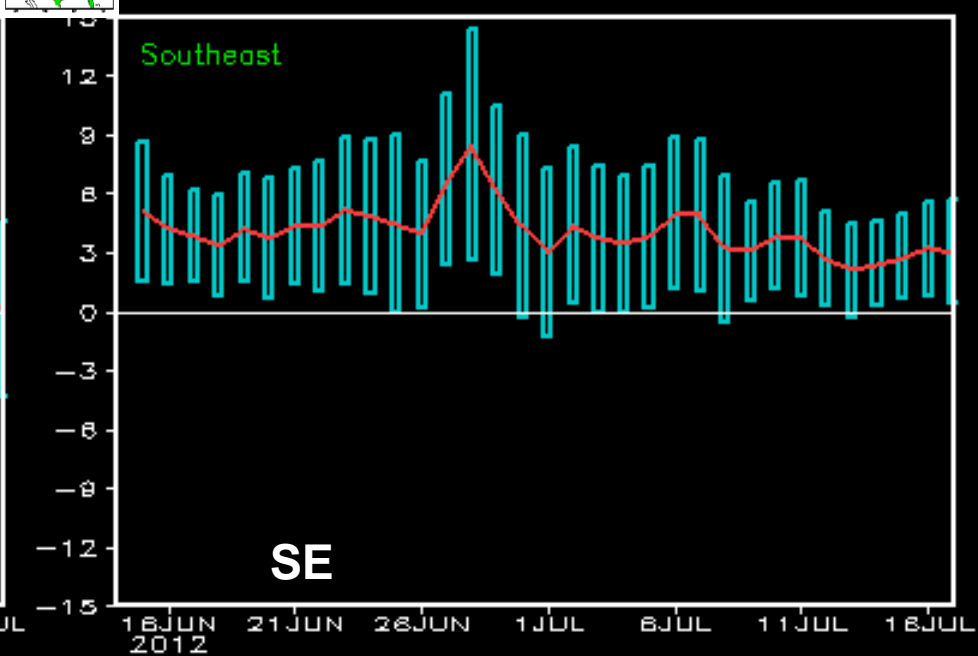
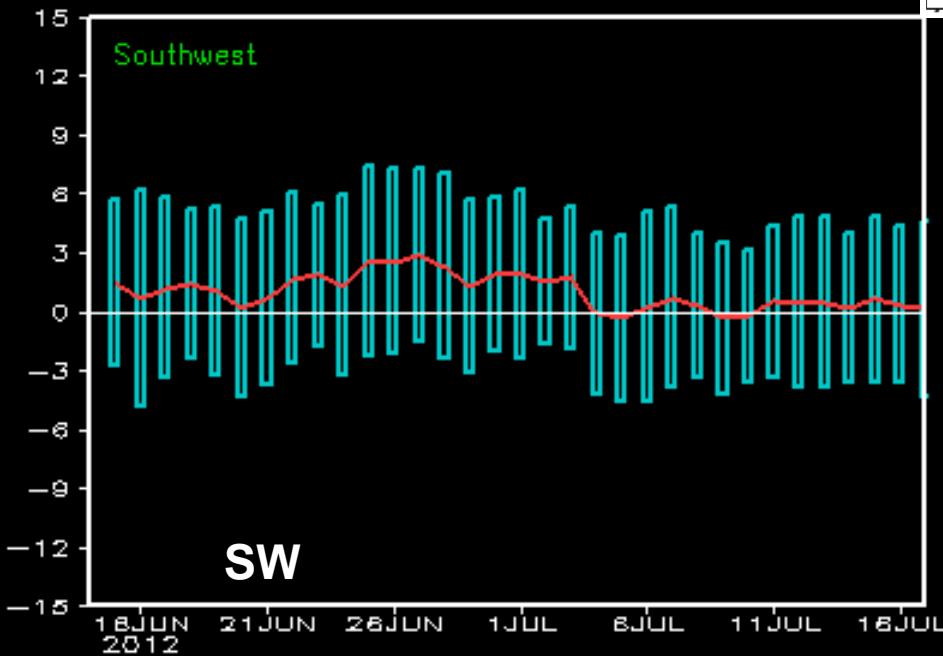
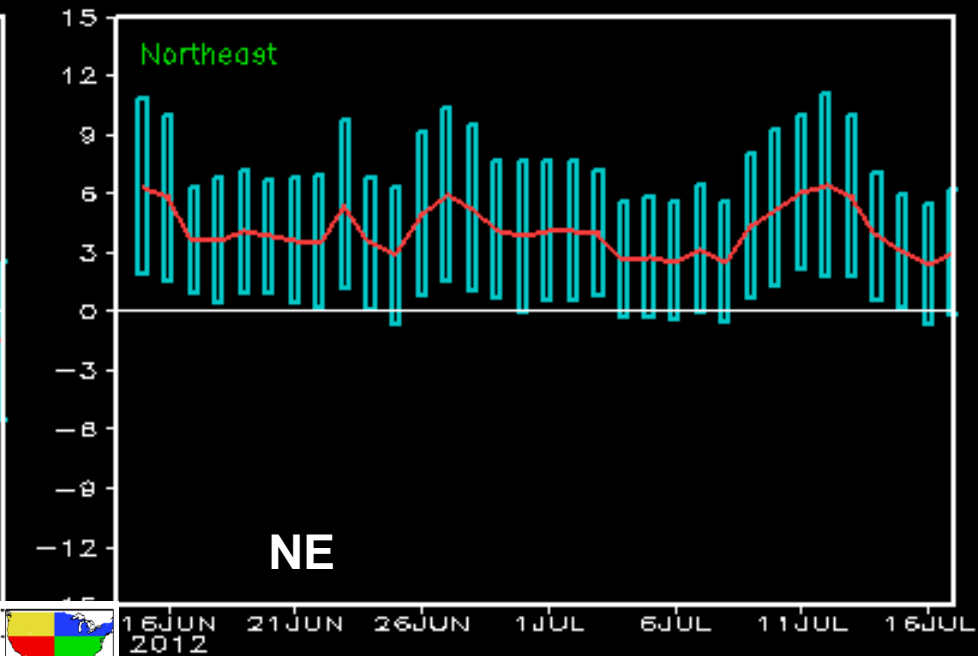
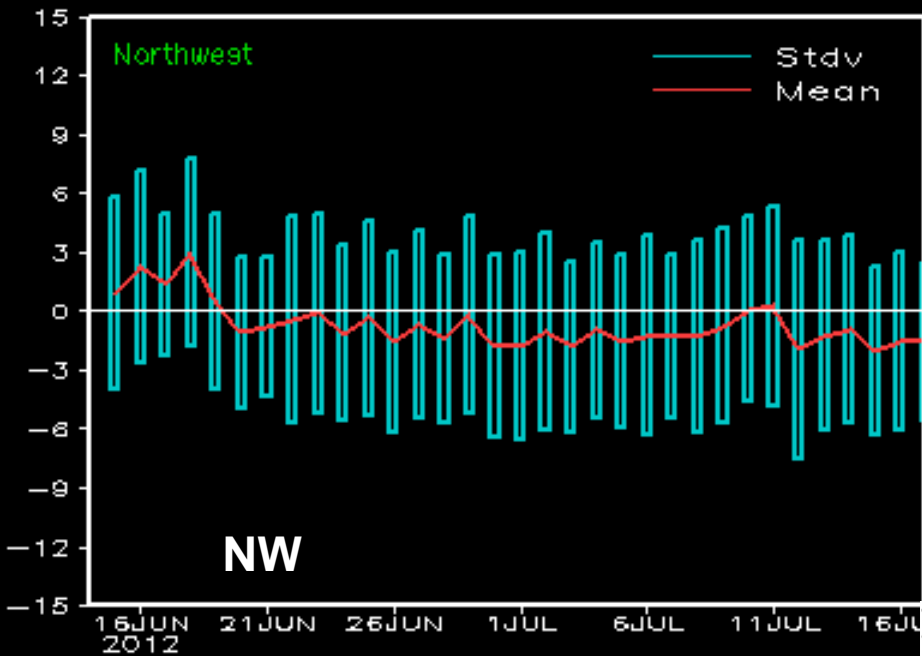


Oper - Obs

Daily GFS DEWP Biases for 024 Hour Projection (00Z Cycle) (unit: °F) – Oper

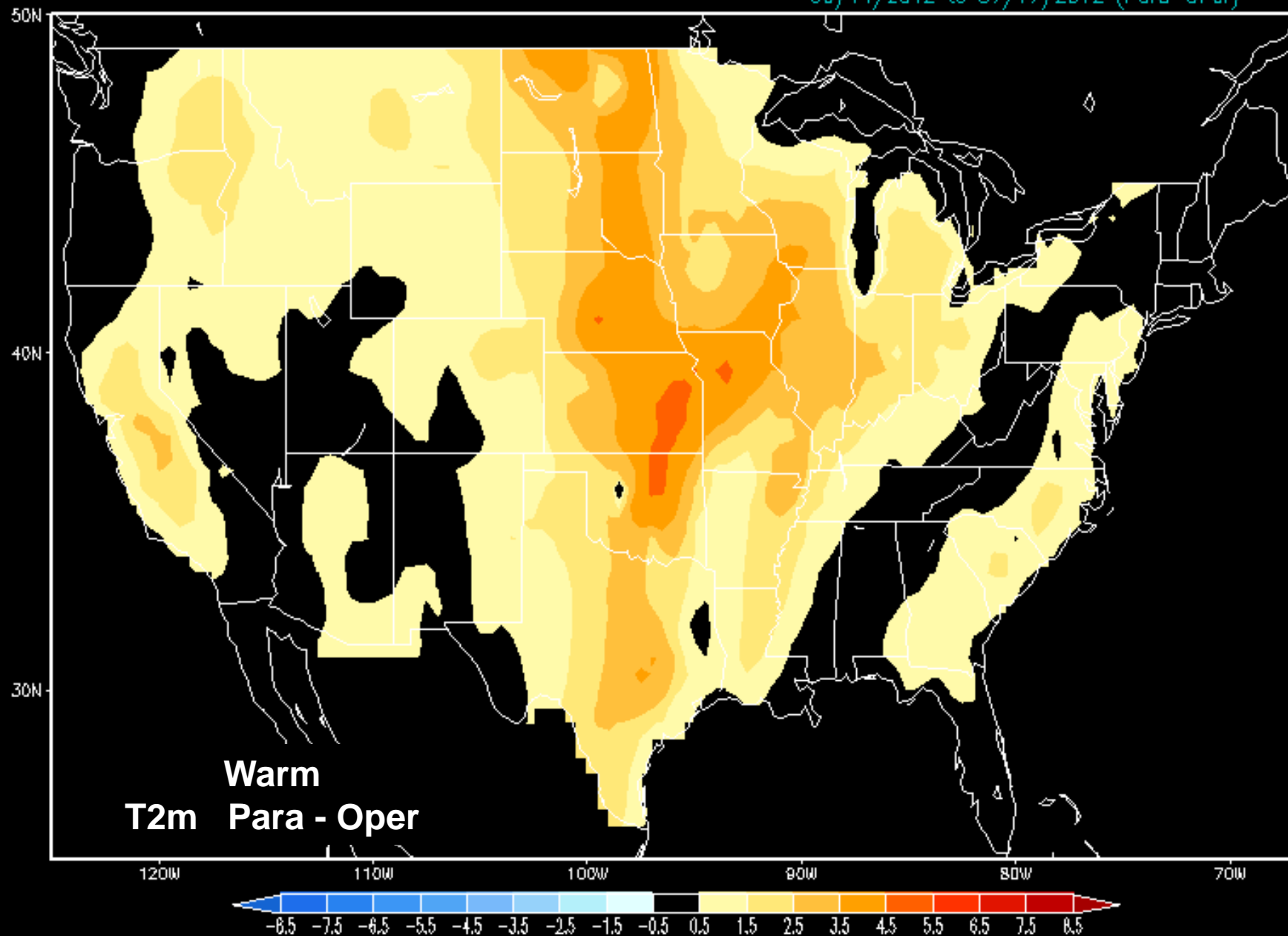


Daily GFS DEWP Biases for 024 Hour Projection (00Z Cycle) (unit: °F) – Prt



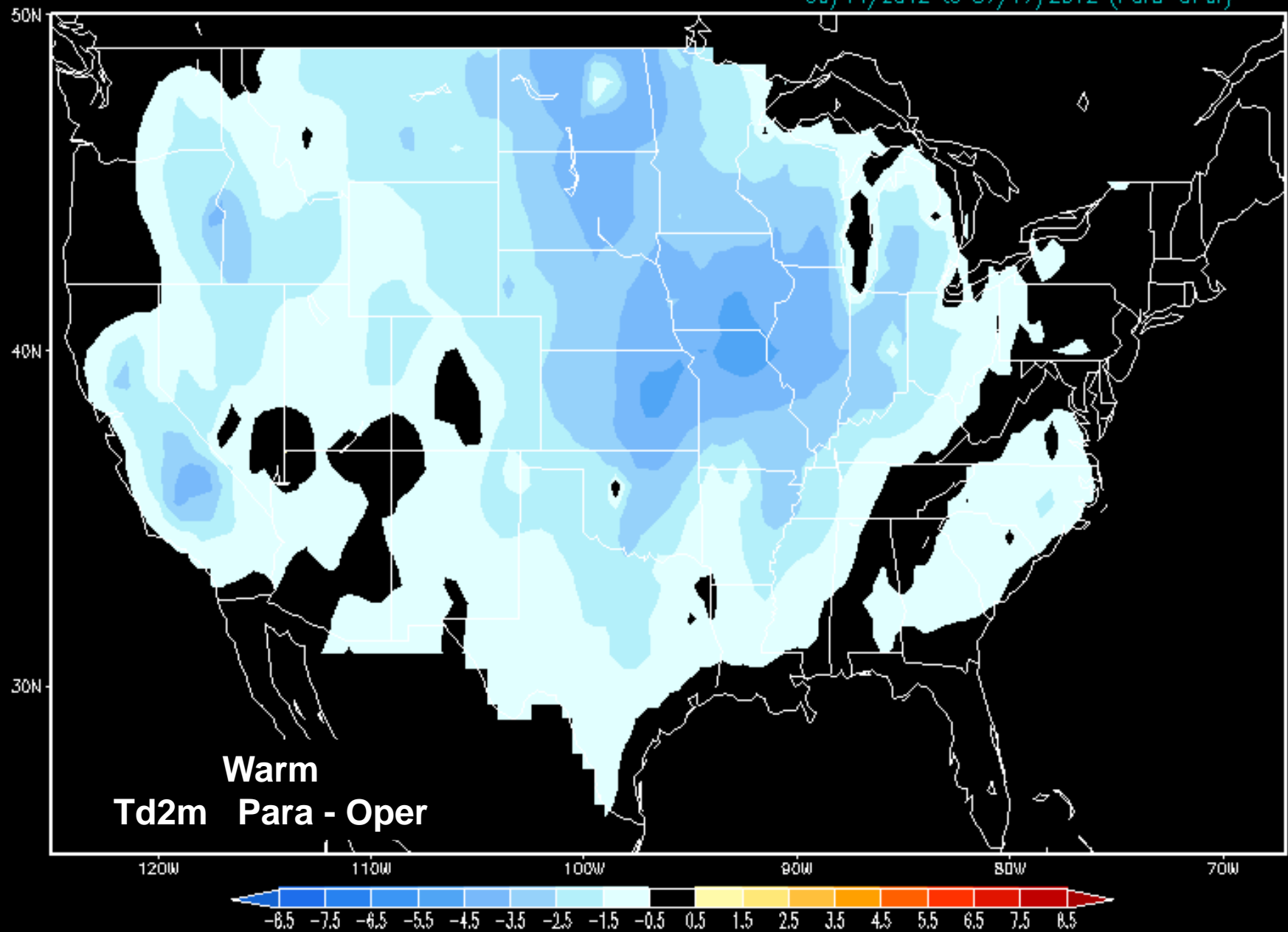
GFS T2m Difference (unit: °F, 24 Hrs Projection, 00Z Cycle)

06/14/2012 to 07/17/2012 (Para-0Per)



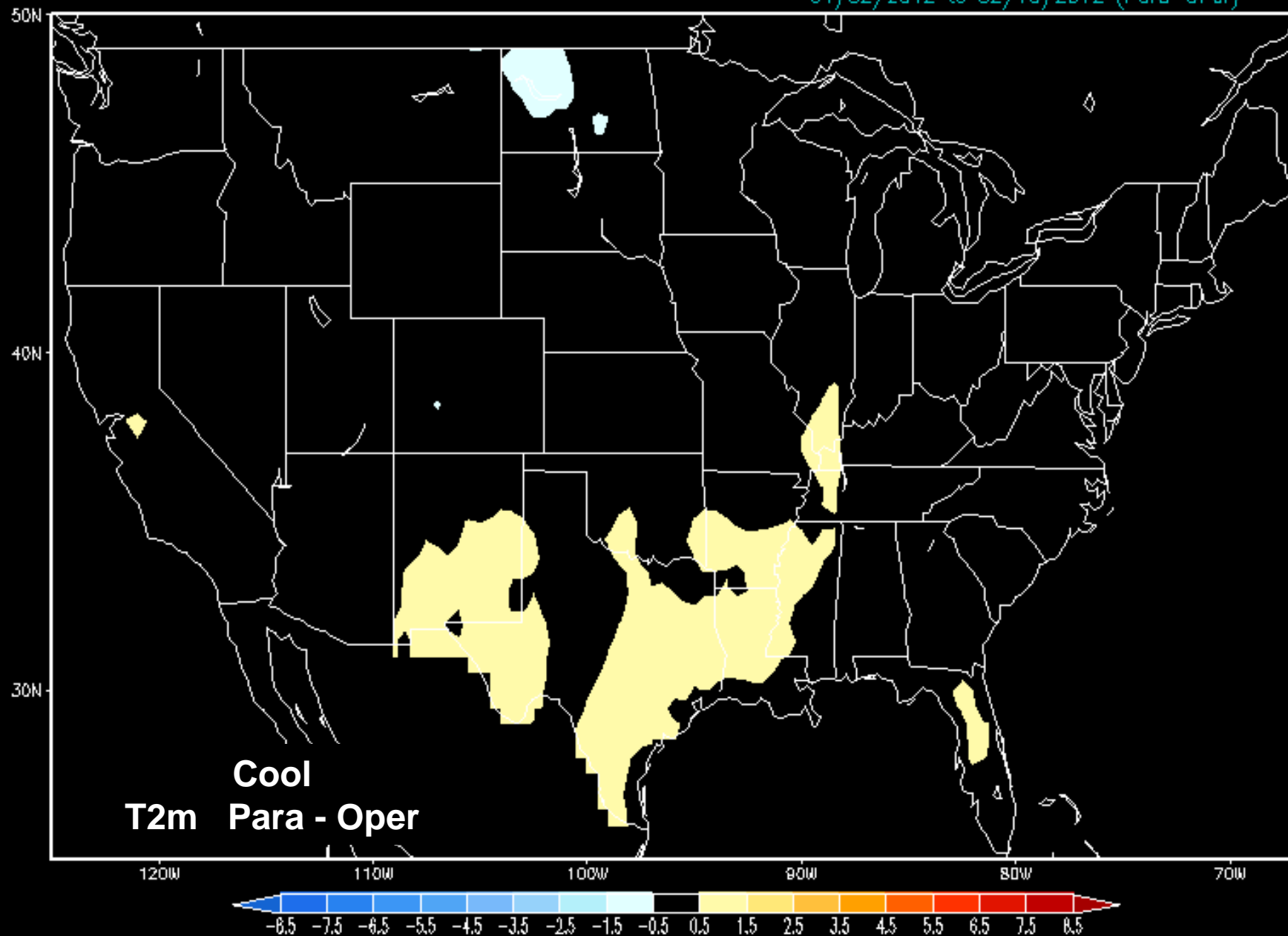
GFS Dewpoint Difference (unit: °F, 06 Hrs Projection, 00Z Cycle)

06/14/2012 to 07/17/2012 (Para-0Per)



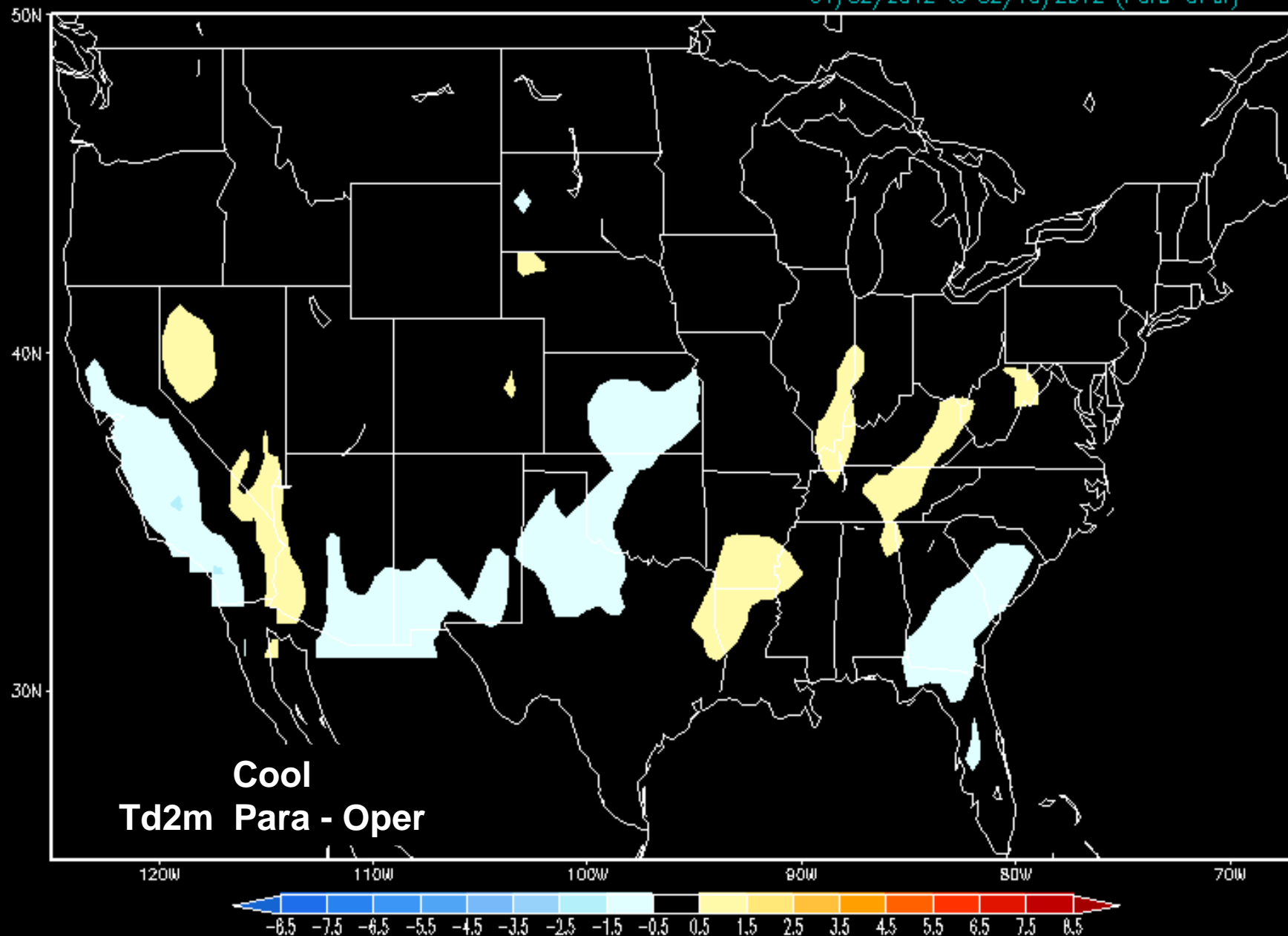
GFS T2m Difference (unit: °F, 48 Hrs Projection, 00Z Cycle)

01/02/2012 to 02/18/2012 (Para-0Per)



GFS Dewpoint Difference (unit: °F, 48 Hrs Projection, 00Z Cycle)

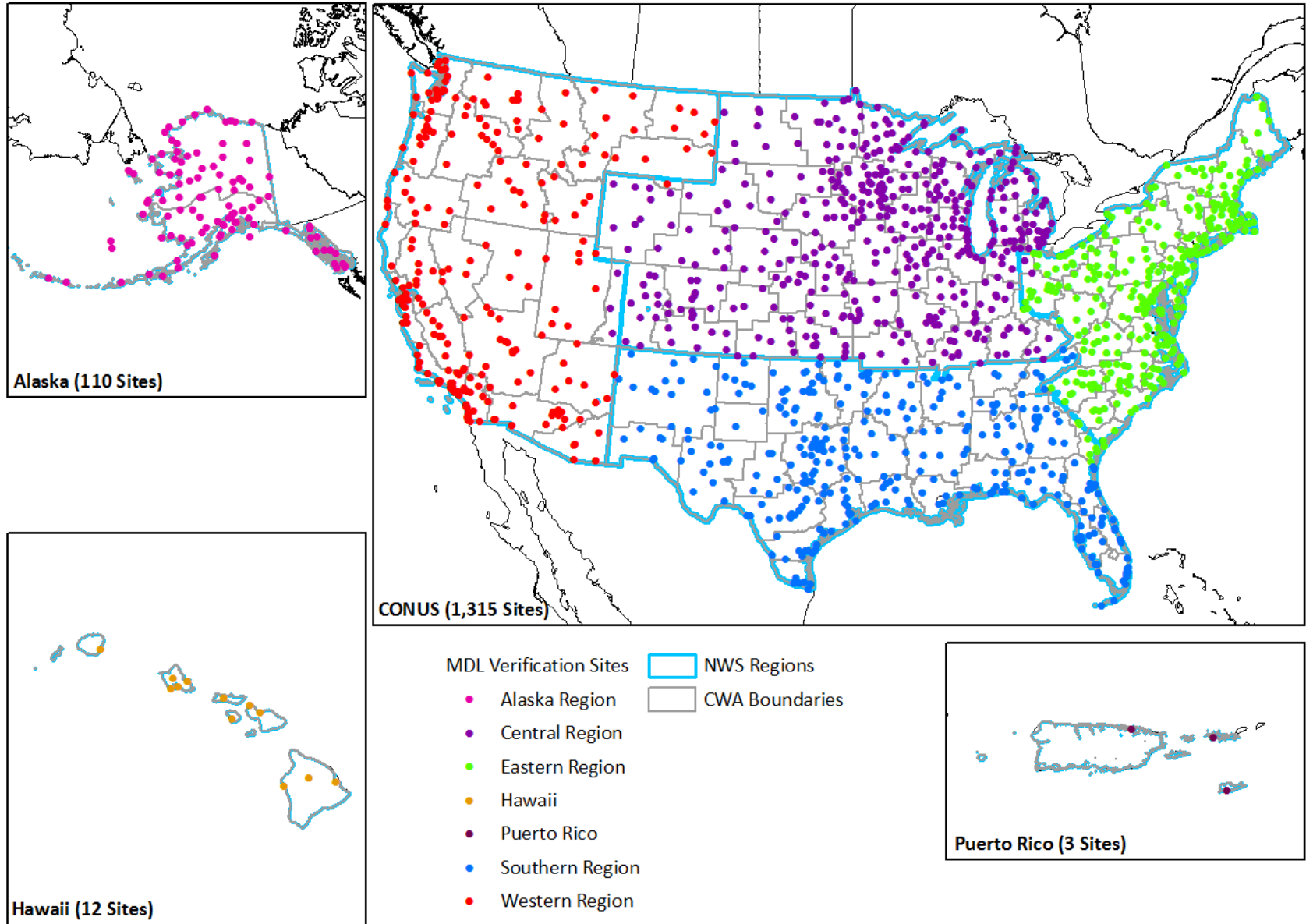
01/02/2012 to 02/18/2012 (Para-0Per)



DMO Summary

1. *For cool season, impact on T2m, Td & Wind Speed are minimal.*
2. *For warm season, overall parallel run results are better than operational runs:*
 - a. *Some T2m improvements appear from 24hr projection, mainly in central US.*
 - b. *For Td, clear improvements start from 6hr projection. However, some degradation can be seen in northwestern region.*
 - c. *Impacts on Wind Speed are still very small.*
3. *MDL analysis in agreement with EMC findings*

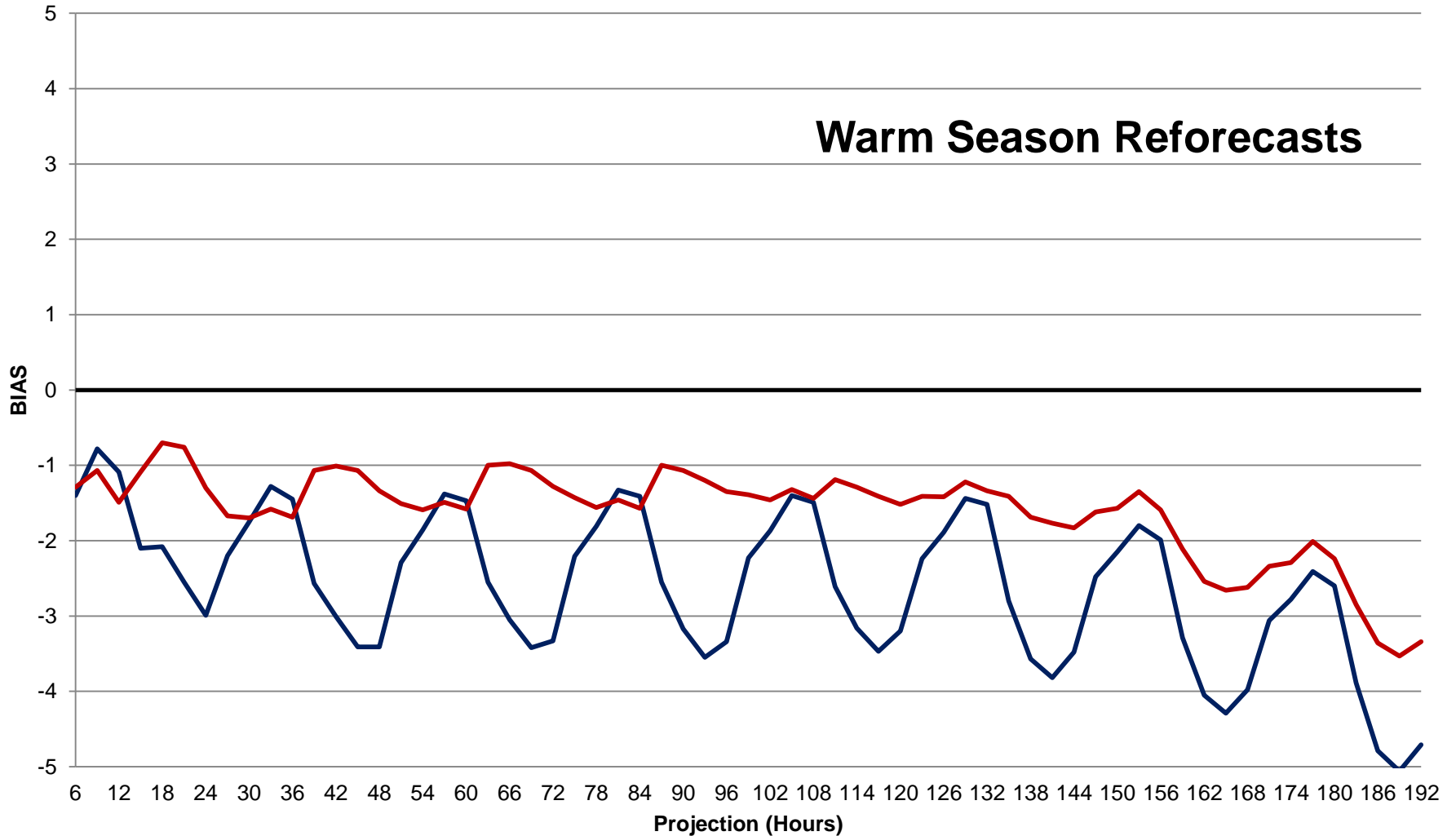
Stations (1440) and regions used in MOS verifications



GFS MOS Temps & Dewpoint

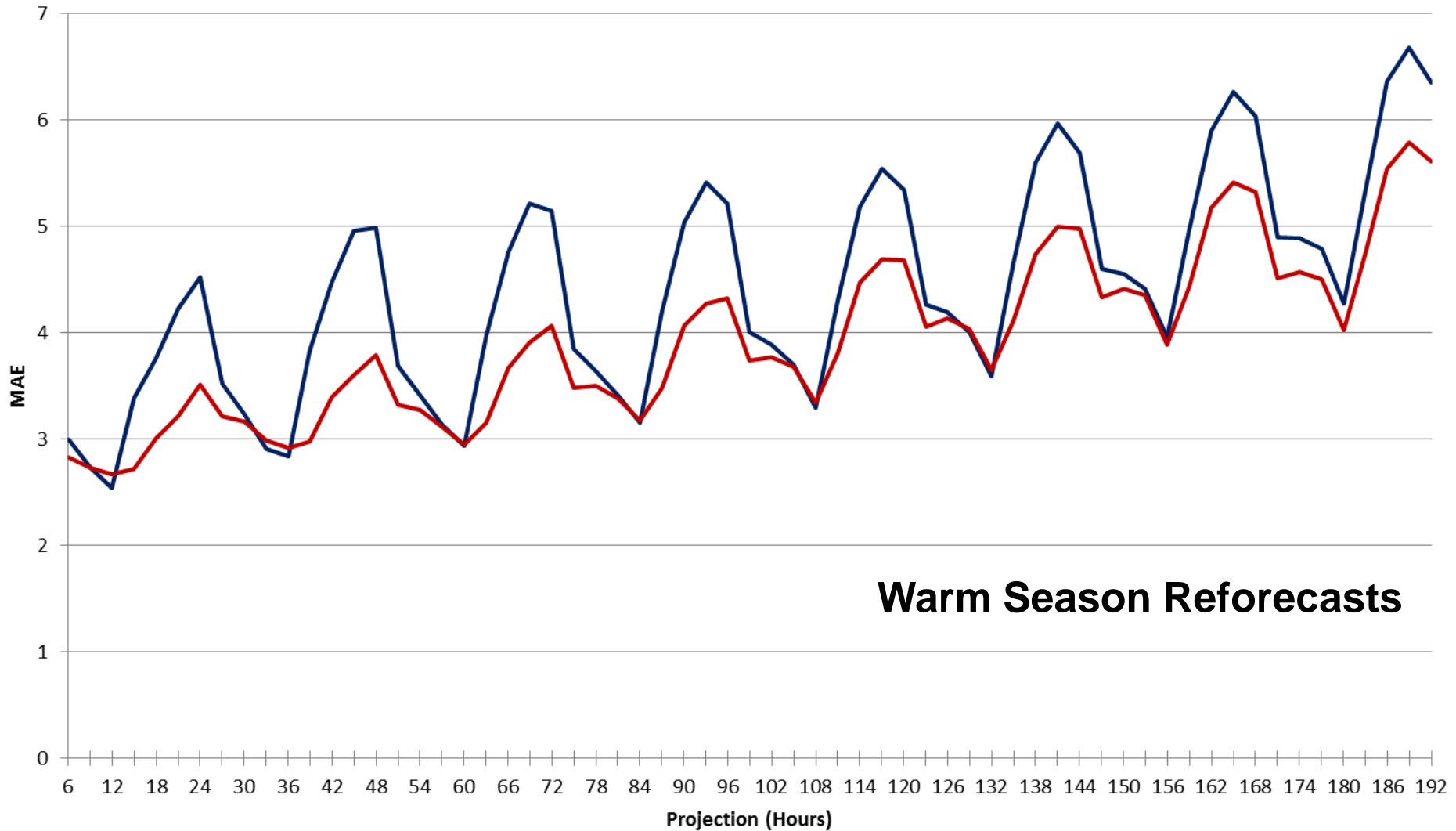
JUN 14 - JUL 17 2012
Temperature - GFS MOS Oper vs. Para - BIAS
Central (440 Stations)

— OPER — PARA



JUN 14 - JUL 17 2012
Temperature - GFS MOS Oper vs. Para - MAE
(Central - 440 Stations)

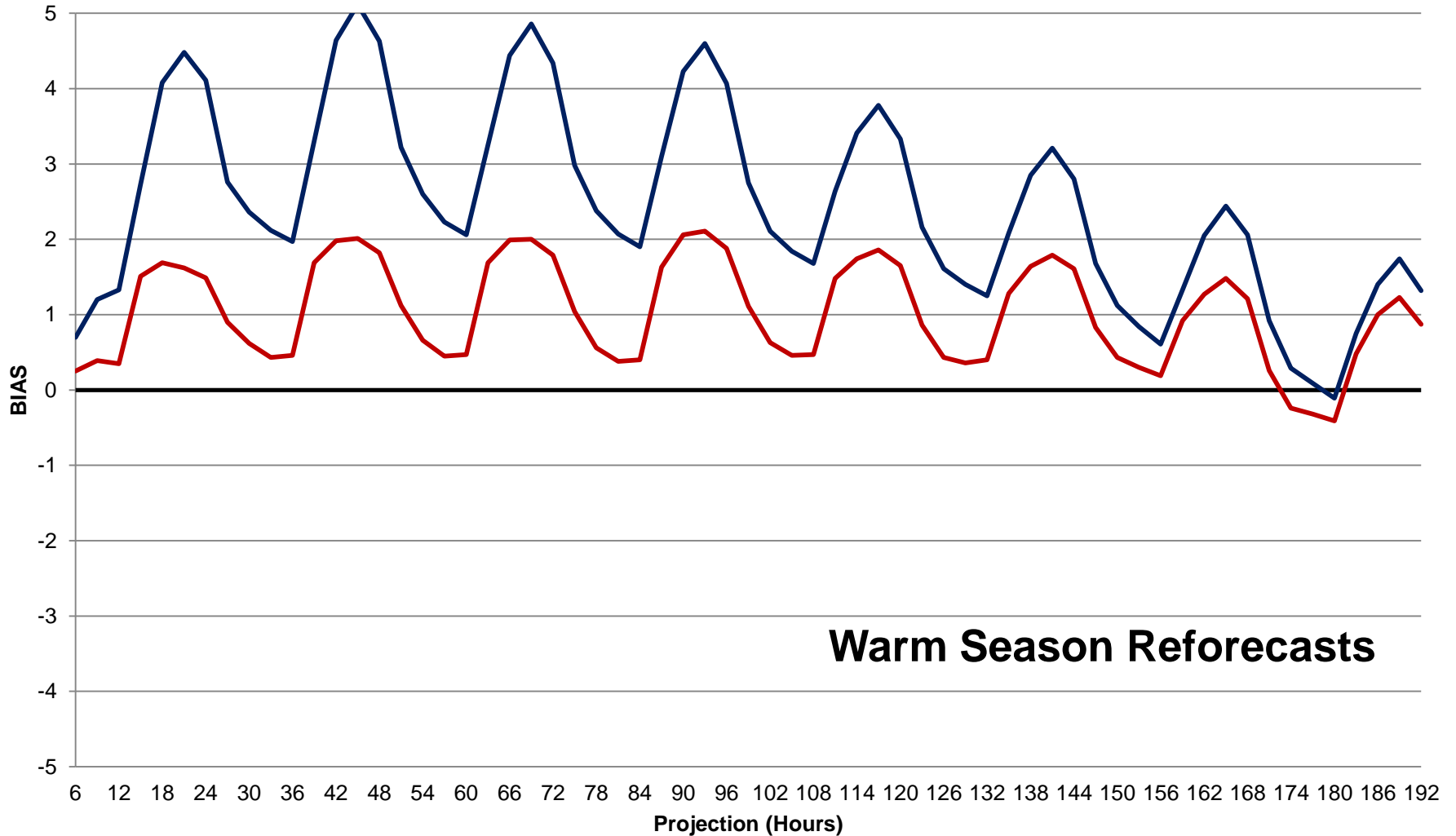
— OPER — PARA



Warm Season Reforecasts

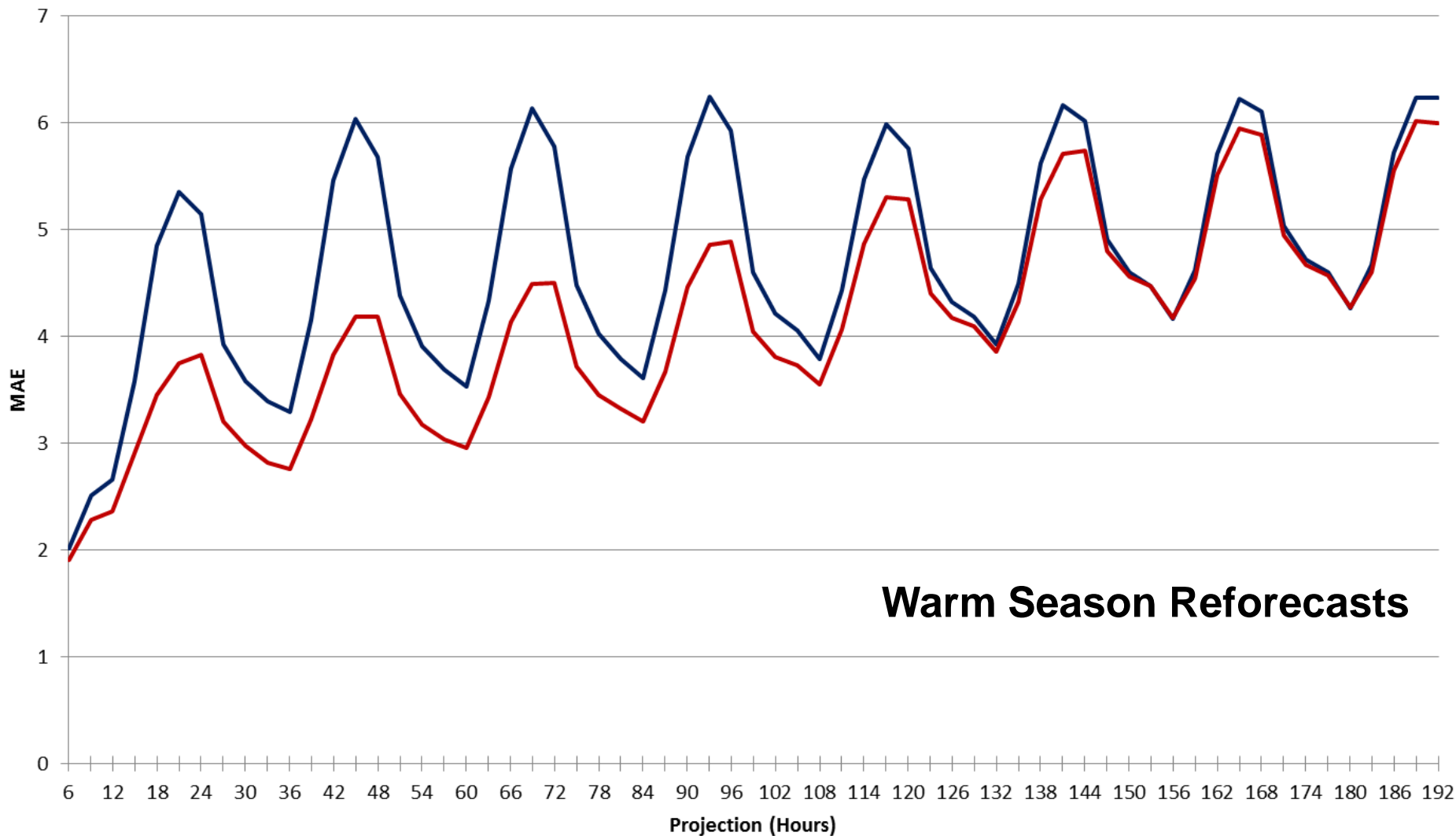
JUN 14 - JUL 17 2012
Dewpoint - GFS MOS Oper vs. Para - BIAS
Central (440 Stations)

— OPER — PARA



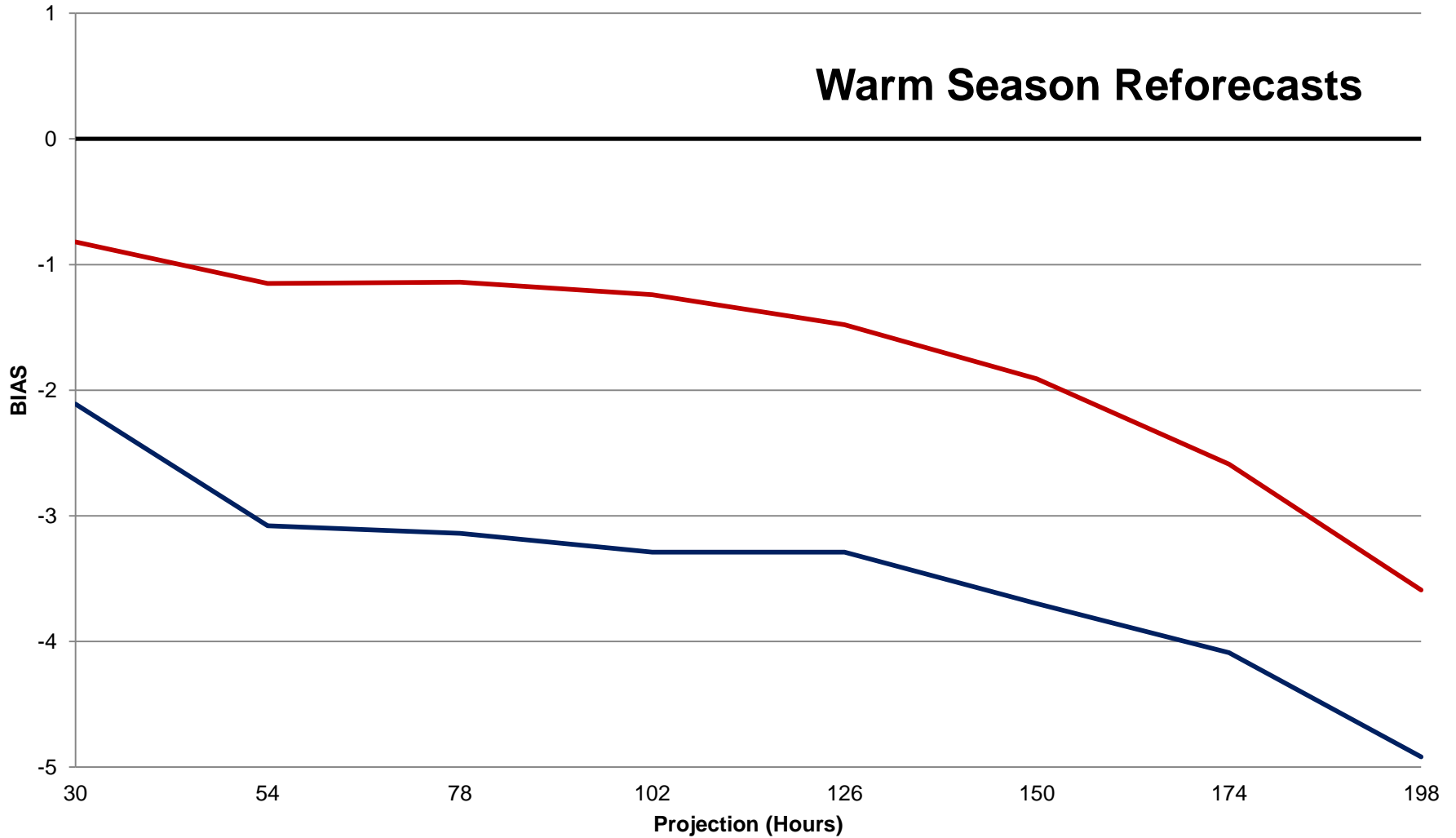
JUN 14 - JUL 17 2012
Dewpoint - GFS MOS Oper vs. Para - MAE
(Central - 440 Stations)

— OPER — PARA



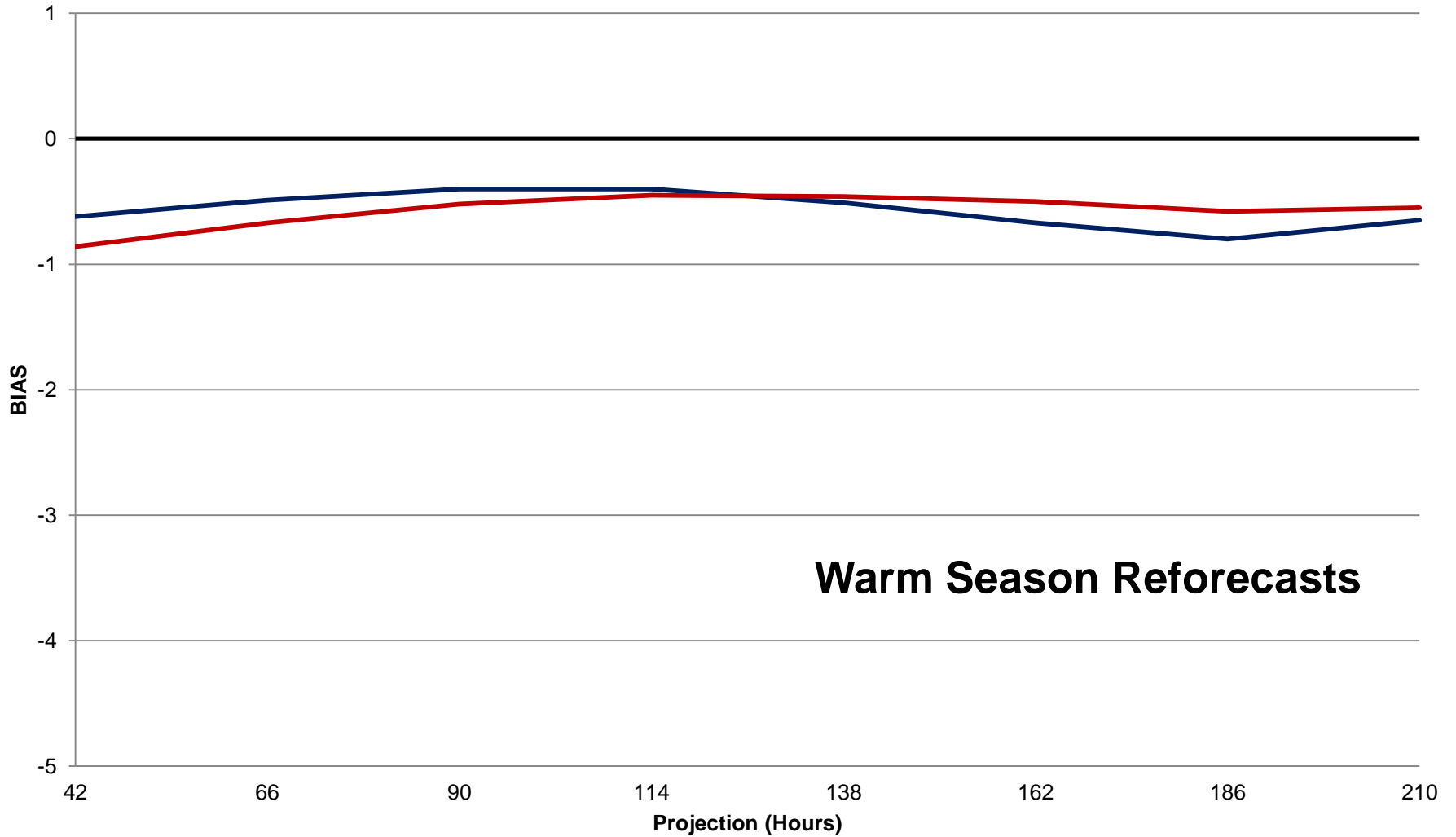
JUN 14 - JUL 17 2012
Max Temp - GFS MOS Oper vs. Para - BIAS
Central (440 Stations)

— OPER — PARA



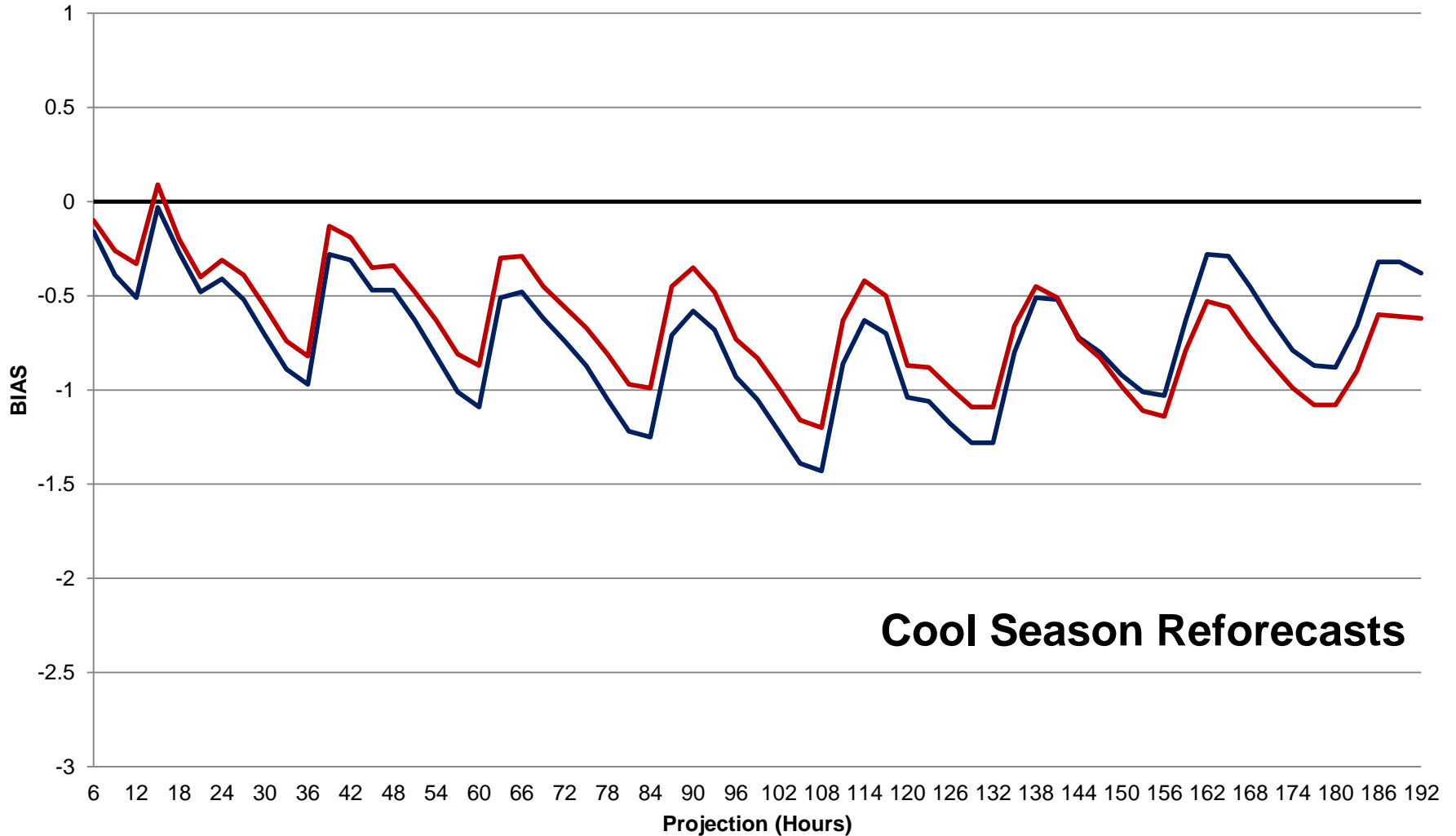
JUN 14 - JUL 17 2012
Min Temp - GFS MOS Oper vs. Para - BIAS
Overall CONUS (1315 Stations)

— OPER — PARA



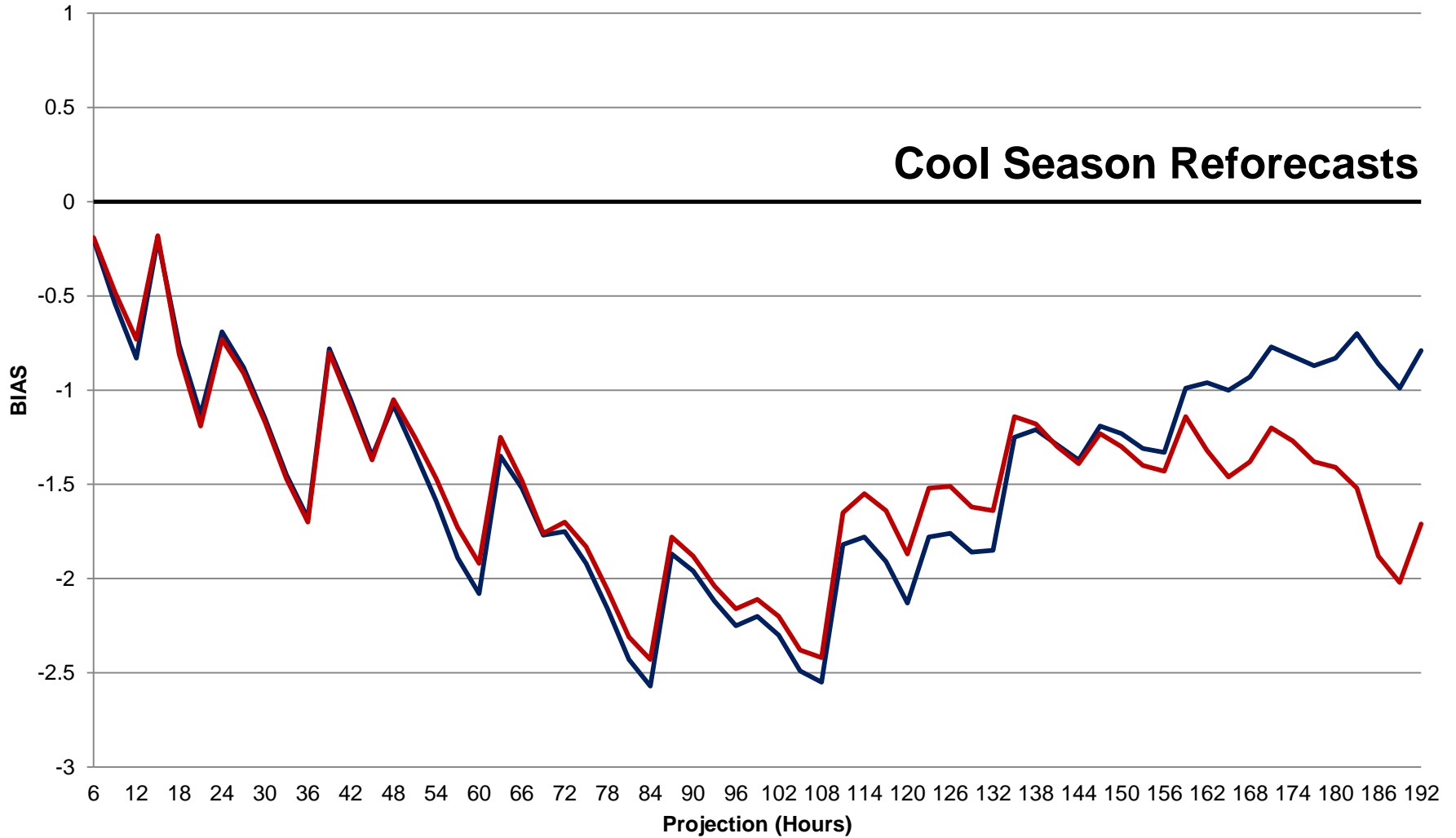
JAN 2 - FEB 18 2012
Temperature - GFS MOS Oper vs. Para - BIAS
Overall CONUS (1315 Stations)

— OPER — PARA



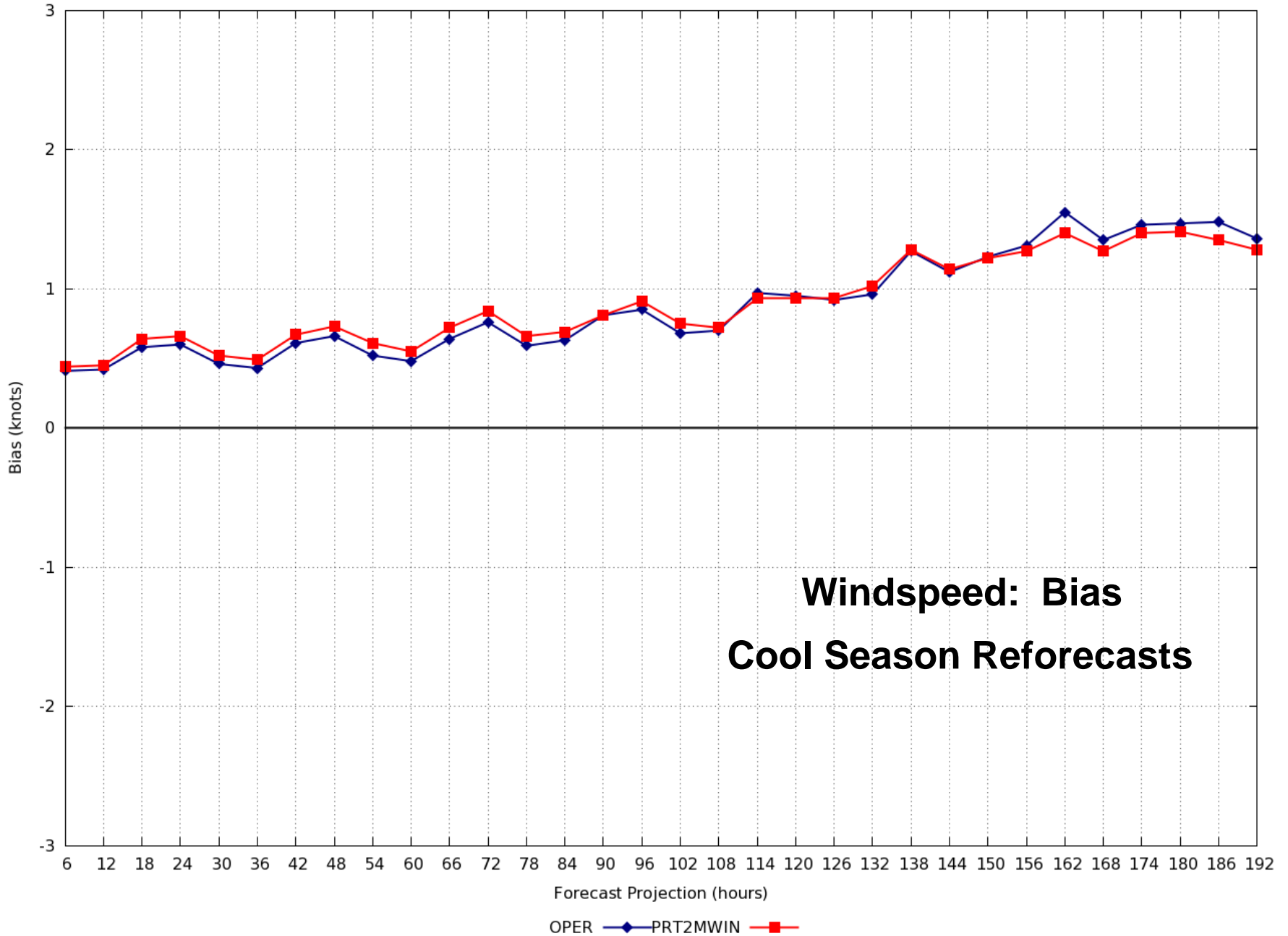
JAN 2 - FEB 18 2012
Temperature - GFS MOS Oper vs. Para - BIAS
Central (440 Stations)

— OPER — PARA

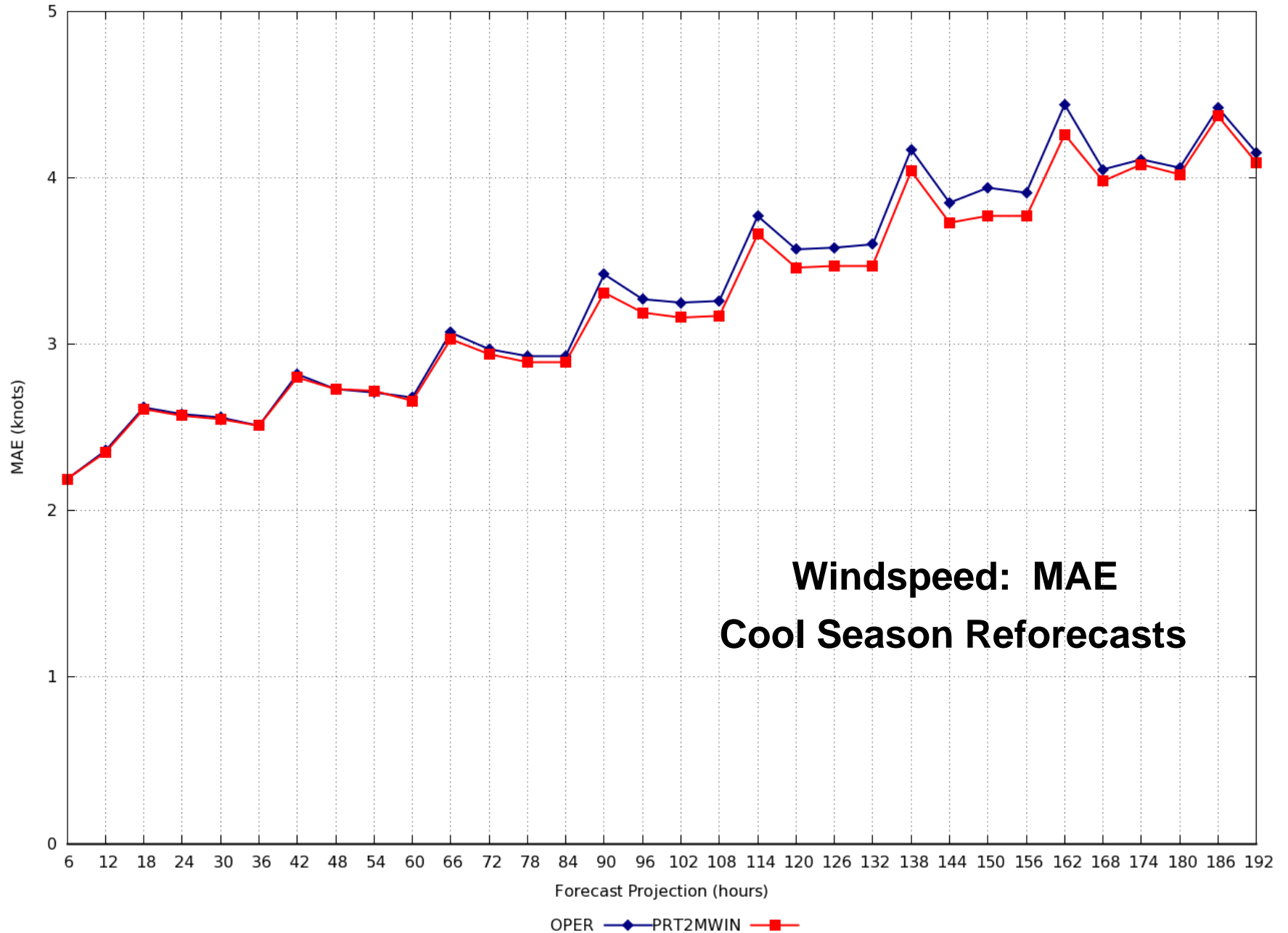


GFS MOS winds

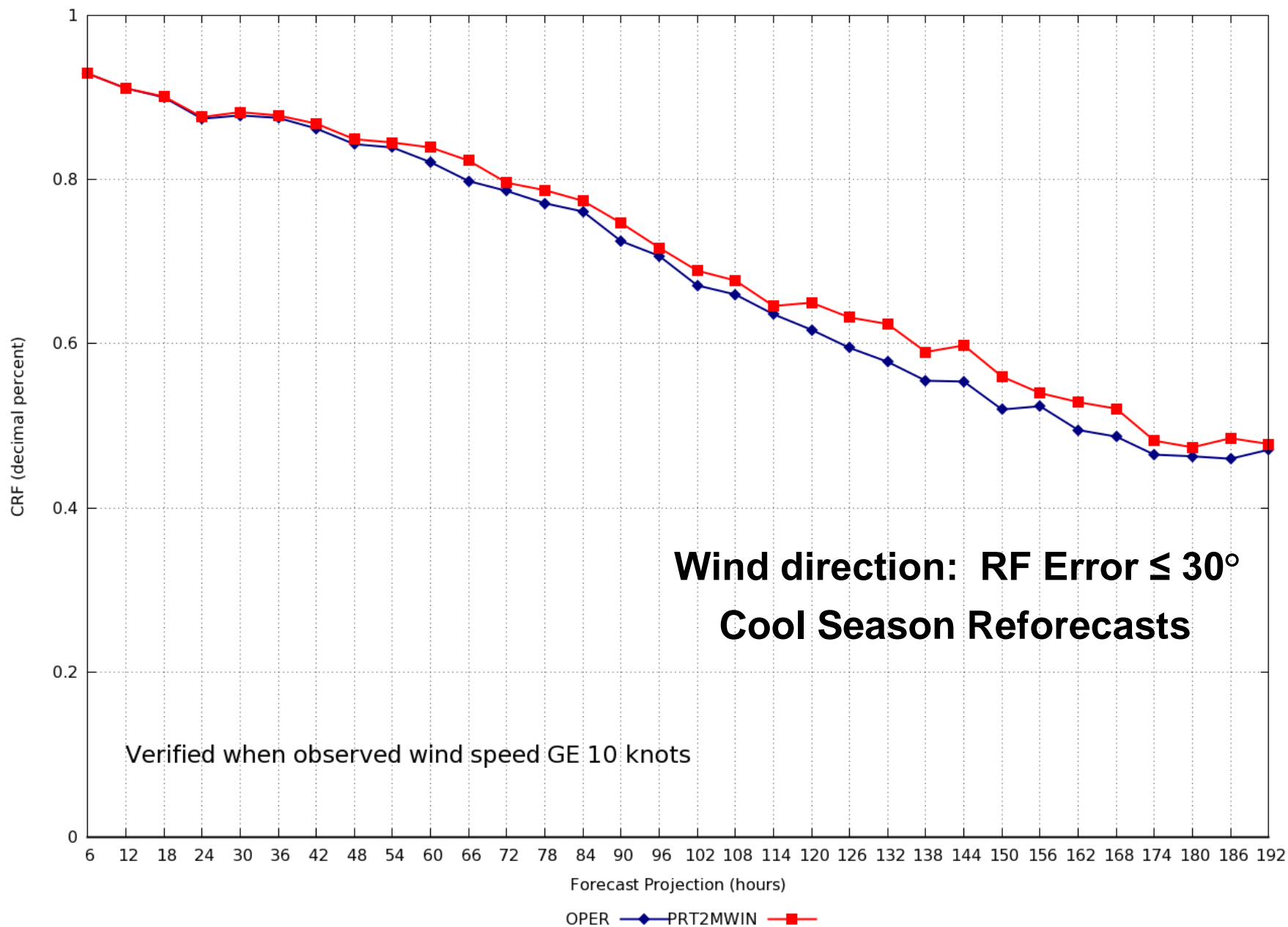
Bias of GFS MOS Wind Speed
20120102 - 20120218 00Z
OVERALL Region



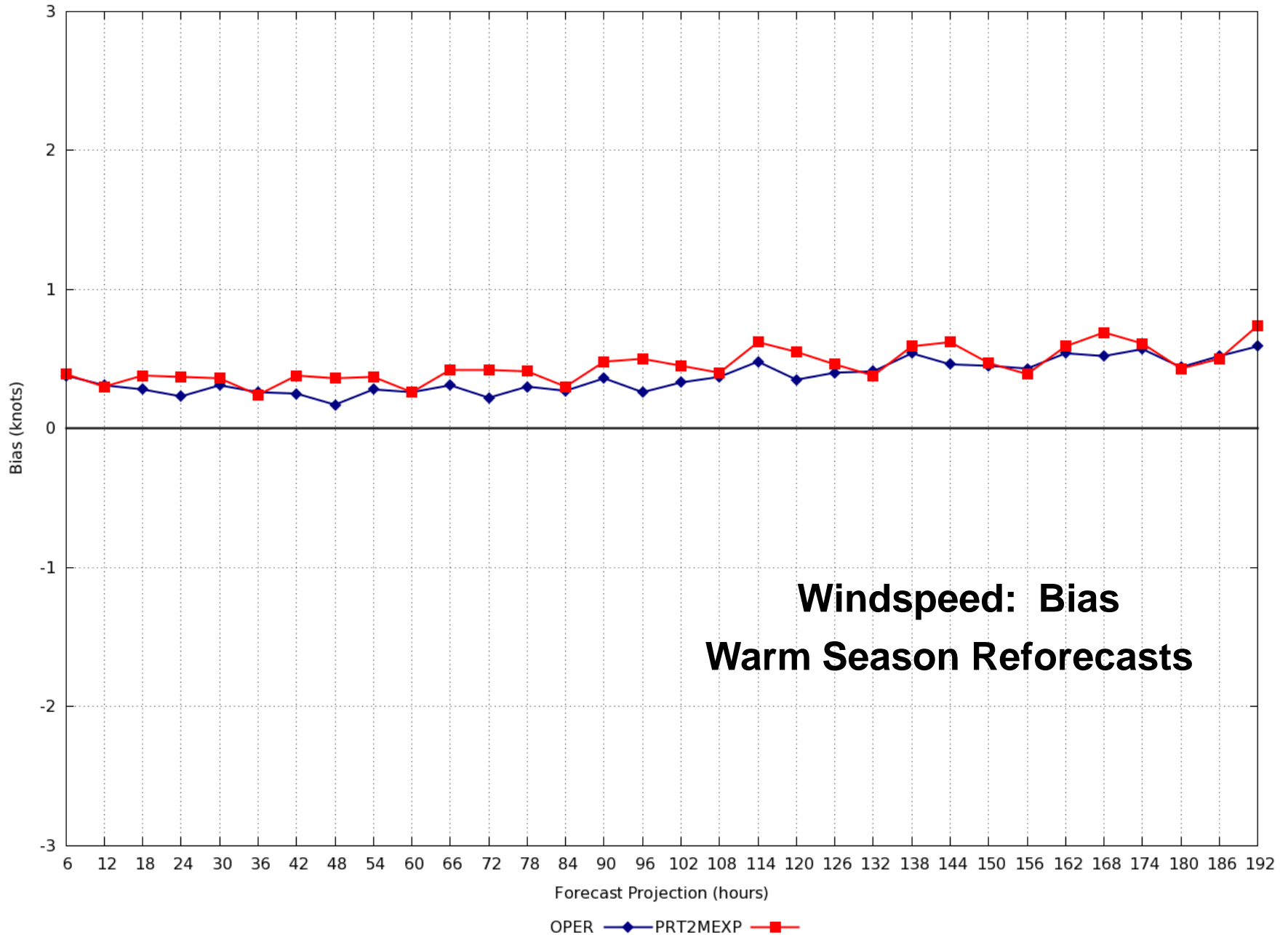
MAE of GFS MOS Wind Speed
20120102 - 20120218 00Z
OVERALL Region



Cumulative Relative Frequency
Errors LE 30 degrees of GFS MOS Wind Direction
20120102 - 20120218 00Z
OVERALL Region



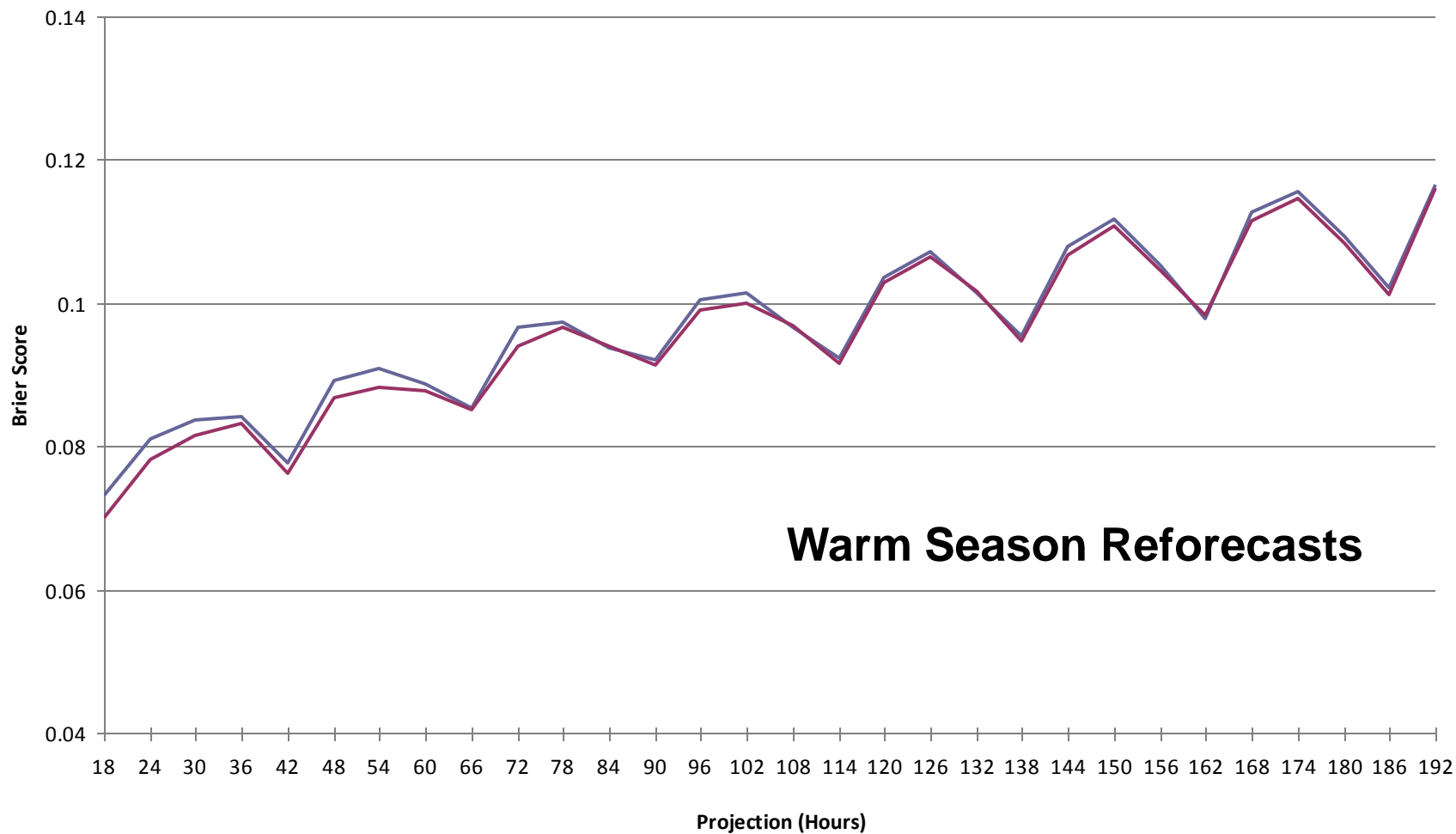
Bias of GFS MOS Wind Speed
20120614 - 20120717 00Z
OVERALL Region



GFS MOS PoP

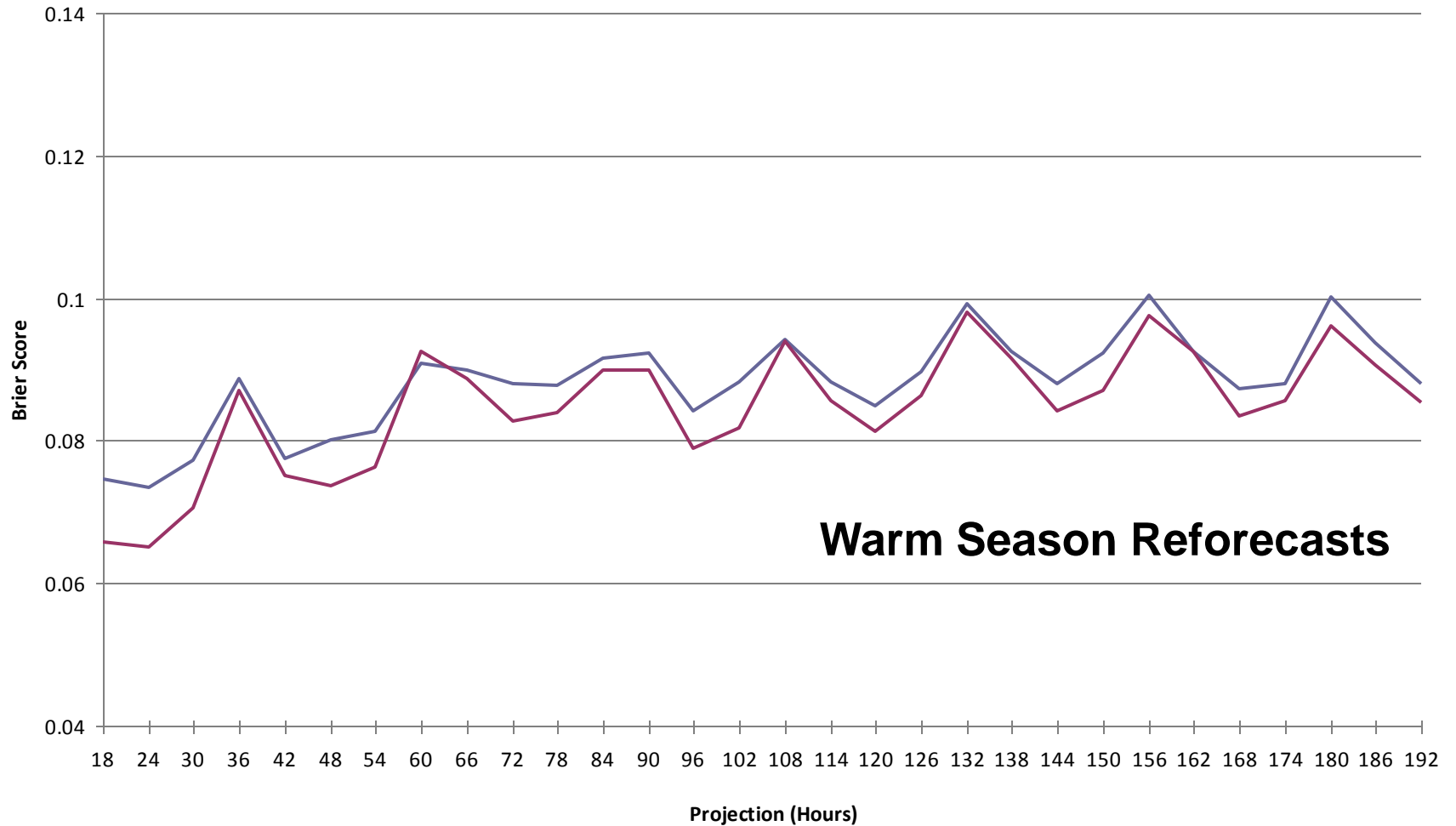
Jun 14 - Jul 17 2012
POP12 - GFS MOS Oper vs. Para - Brier Score
Overall CONUS (1315 Stations)

— OPER — PARA

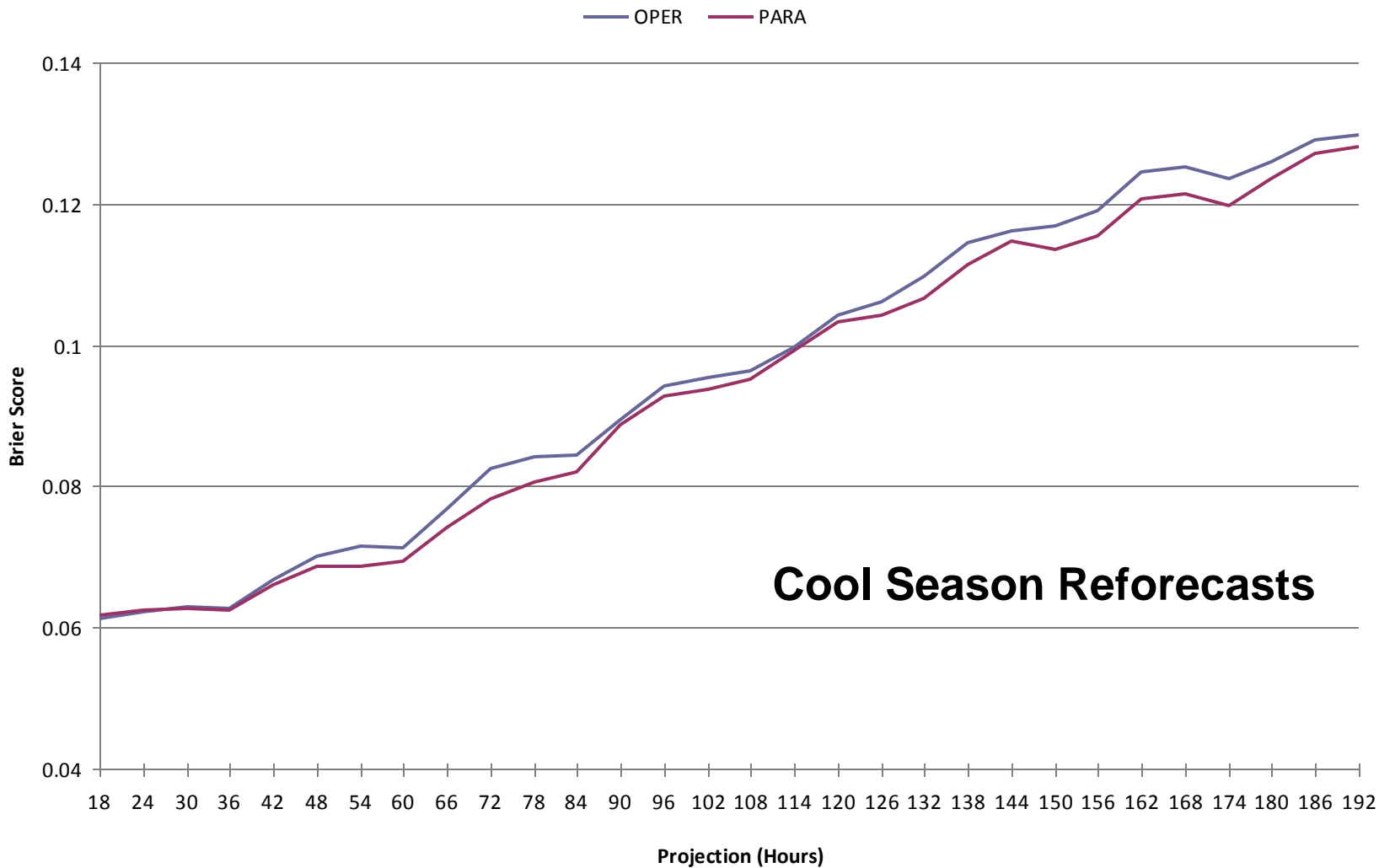


Jun 14 - Jul 17 2012
POP12 - GFS MOS Oper vs. Para - Brier Score
Central (440 Stations)

— OPER — PARA



Jan 2 - Feb 18 2012
POP12 - GFS MOS Oper vs. Para - Brier Score
Overall CONUS (1315 Stations)



Preliminary conclusions

- **Para GFS output warmer, drier than current Oper version**
 - Mostly warm season/central US; Cool season largely unaffected.
 - Desired EMC result!
- **GFS MOS temp/dewpoints generally benefit from change**
 - Some cool-season degradation beyond 144h in central US.
 - Min temps more of a “mixed bag” (more radiational cooling?)
- **Little impact on GFS MOS winds**
 - Perhaps slight improvement in cool season
 - Need to be wary of changes which increase model 2m wind speed!
- **Slight improvement in MOS PoP, mainly central US**

Preliminary conclusions (& caveats!)

- **Generally, changes which affect model biases will have adverse impact on operational MOS system**
 - Pronounced warm-season Oper/Para bias changes in T/Td fields.
- **In this case, oper GFS MOS dependent sample (2002-2009) more closely reflects Para configuration**
- **MDL recommendation: NCEP should proceed with implementation of q-table change**
 - Analysis suggests mostly positive effects on MOS.
 - Limited reforecast samples, bulk verification statistics.
 - Can't guarantee isolated "surprises" at individual stations